

REMARKS

Claims 1-22 are presently pending in the application. Reconsideration and allowance of all claims are respectfully requested in view of the following remarks.

As a preliminary matter, the Applicants and the undersigned thank the Examiner for the courtesies extended during the personal interview of April 27, 2006. During the interview, the prior art references of Neal and Schütze were discussed, and the Applicants respectfully argued that the Examiner is misapplying 35 U.S.C. §103, and that the combination of the Neal and Schütze references fails to teach or suggest the diffraction means for simultaneously creating a plurality of separate laser beams from each of the at least one laser beam.

No agreement was reached, although the Examiner agreed to reconsider the Applicants' arguments as follows.

Drawings

The Examiner has objected to the drawings submitted on September 14, 2005, as containing new matter and they have not been entered. The Examiner states that the DOE 40 should be shown directly in front of the plane containing point B.

The Examiner is respectfully requested to acknowledge receipt of three (3) sheets of drawing corrections/replacement sheets, which amend the drawings to correct for minor informalities. Further, FIGS. 3A and 3B have been reintroduced, and FIG. 3B has been amended to move the DOE 40 to be shown directly in front of the plane containing point B.

Due to these changes, the specification has been amended to reinsert references to FIG. 3B.

The drawing corrections should obviate the Examiner's objections.

Specification

The Examiner has objected to the specification as failing to provide proper antecedent basis for the claimed subject matter, stating that with respect to Claims 11 and 22, the specification and drawings fail to show or recite the diffractive optical element (DOE) being positioned in the back focal plane of the focusing element.

First, the Applicants respectfully submit that the claimed features of the DOE being positioned in the back focal plane of the focusing element is part of the original specification, as they are recited in the original claims, and thus, provides proper antecedent basis for the claimed subject matter.

Second, the Examiner alleges that the back focal plane of the focusing element (objective lens 20) is between lenses L1 and L2, which is incorrect. The Examiner is respectfully requested to acknowledge the amendment to FIG. 3B, which shows the DOE in the back focal plane of the focusing element. Accordingly, the Examiner's objection to the specification should be withdrawn.

In addition, the Examiner has objected to the specification due to the addition of the paragraphs that include mention of FIG. 3B. However, the corrections to the drawings (above) and the reinsertion of the changes to the specification (above) should obviate this rejection.

Prior Art Rejections

The Examiner has rejected Claims 1-2, 4, 6-9, 12-13, 15 and 17-20 under 35 U.S.C. §103 as being unpatentable over Neal (U.S. Patent No. 5,939,716), in view of Schütze (U.S. Patent No. 5,689,109). The Examiner has rejected Claims 3 and 14 under 35 U.S.C. §103(a) as being unpatentable over Neal in view of Schütze and further in view of Long (U.S. Patent No. 5,986,781). Claims 5 and 16 were rejected under 35 U.S.C. §103(a) as being unpatentable over Neal in view of Schütze, and further in view of Sasaki et al. (K. Sasaki, M. Koshioka, H. Misawa, N. Kitamura, H. Masuhara, 'Pattern formation and flow control of fine

particles by laser-scanning micromanipulation', Opt. Lett., vol. 16, no. 19, October 1, 1991, pp. 1463-1465.). Claims 10 and 21 were rejected under 35 U.S.C. §103(a) as being unpatentable over Neal in view of Schütze and further in view of Sasaki et al. Finally, Claims 11 and 22, as best understood by the Examiner, were rejected under 35 U.S.C. §103(a) as being unpatentable over Neal in view of Schütze.

The Applicants respectfully submit that the Examiner misunderstands the application of 35 U.S.C. §103. Although the combination of the references must teach or suggest the claim limitations, the Examiner has not shown that there is any motivation to combine the two references to achieve the claimed features of the present invention. Further, the fact that references can be combined or modified does not render the resultant combination obvious unless the prior art also suggests the desirability of the combination. Still further, even if combined, the two references must teach or suggest the claimed features of the present invention. Since none of these prerequisites are present, the Examiner's rejection of the claims are not proper.

Specifically, the Applicants respectfully submit that neither the individual nor the combination of the Neal and Schütze references teaches or suggests a method for manipulating a plurality of particles by forming and moving a plurality of optical traps, the method including: providing at least one laser beam from at least one source; applying the at least one laser beam to diffraction means for simultaneously creating a plurality of separate laser beams from each of the at least one laser beam; establishing an optical gradient for each of the plurality of separate laser beams to form a plurality of separate optical traps capable of being moved in different directions, for moving the plurality of particles; and performing a manufacturing process which changes the position of at least one of the plurality of particles in a predetermined direction, as recited in amended Claims 1 and 12.

Rather, Neal is directed to a method and apparatus for containing a single reflective

particle in a single light cage. Specifically, Neal discloses that "(t)he present invention is a method and apparatus for trapping a reflective ... particle without the use of a scanning mirror, multiple light sources, or active feedback control mechanism" (emphasis added). Neal teaches the use of a light beam from "single source 26" (col. 5, line 51), to illuminate an optics system 32 and generate a number of discrete focussed beams using a diffractive element 18, where the set of focussed beams create a "light cage" 10 (see col. 5, lines 50-59).

Further, Neal discloses that "at least three focussed beams are required to provide passive stability within the light cage 10, with greater stability being achieved as the number of focussed beams is increased" (see col. 5, lines 63-67). However, only a single particle is trapped within the single light cage 10 formed by the three focussed beams in Neal. The Applicants noted that Neal discloses only a single reflective particle in a single light cage, and does not use multiple light sources. Further, Neal discloses using at least three focused beams to provide passive stability within the light cage, with greater stability being achieved as the number of focused beams is increased; yet still only a single particle is trapped within the single light cage.

Thus, the diffraction element 18 in Neal cannot be said to be a "means" for simultaneously creating a plurality of separate laser beams from each laser beam, to form a plurality of optical traps.

Further, the optical traps of the present invention can be moved separately in different directions, to move the plurality of particles in the separate traps in different (predetermined) directions if desired (i.e., see page 12, lines 3-11, of the present specification) – contrary to Neal. Rather, Neal's light cage is static, whereas in the present invention, the optical traps can be translated in three dimensions by various means (i.e., they are capable of being moved in different directions, as recited in amended Claims 1 and 12).

Further, Neal's light cage is adjusted by means of a mechanical zoom lens, whereas in

the present invention, there are no moving parts. Movement in Neal - utilizing the zoom lens - involves a specific change in scale of the pattern of focused light beams, but does not allow for translation of the pattern either along or transverse of the optical axis. This also contrasts with the present invention, in which each trap can be translated (i.e., moved) independently along any set of three-dimensional paths. Moreover, the number of traps projected by the optical trapping system of the present invention can be changed dynamically, with individual traps being added or removed independently.

Still further, Neal's system does not permit imaging because of the placement of the diffractive optical element. In the present invention, in contrast, trapped objects can be imaged.

Still further, the diffraction means being a time-addressable phase shifting medium, as recited in Claims 3 and 14, is not disclosed in Neal. The Examiner points to the fact that he considers the diffraction element in Neal to be equated with the diffractive optical element of the present invention, and that he is using the Schütze reference to disclose that it is possible to generate a plurality of optical traps (using a beam splitter).

Further, although Schütze discloses generating a plurality of optical traps, the traps are generated using a plurality of lasers 3, 4, which generate a plurality of beams of different wavelengths, which is contrary to the teachings of Neal. Further, the plurality of beams from the plurality of lasers 3, 4 are not generated using diffraction means, but simply by using a beam splitter 16. Thus, there is no motivation to combine the references since Neal teaches away from multiple beams forming multiple light cages.

Further, assuming *arguendo* that Neal could be adapted to form multiple light cages, as stated above, Neal teaches that it would require at least three beams per light cage to trap each particle, rather than a single beam for trapping each particle as in the present invention. Schütze does not make up for the deficiencies in Neal, since Schütze does not teach or

suggest diffraction means to form the multiple beams.

Still further, there is no place to insert an additional diffractive optical element in Neal's system to create multiple optical cages. Additional optical elements (i.e., excessive modification) would have to be introduced to create the necessary conditions to relay the multiplied beams to the focusing element.

Still further, if, as Schütze teaches, a beam splitter is added to create multiple optical traps, then a diffraction element would have to be added to each beam to generate multiple light cages. This would not be a workable or efficient solution, and thus, one of ordinary skill in the art would not have been motivated to combined the references to achieve the claimed features of the present invention without the use of impermissible hindsight.

Accordingly, since Neal teaches away from Schütze, there is no motivation to combine the two references to achieve the claimed features of the present invention. The Applicants respectfully remind the Examiner that obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found either explicitly or implicitly in the references themselves or in the knowledge generally available to one of ordinary skill in the art. "The test for an implicit showing is what the combined teachings, knowledge of one of ordinary skill in the art, and the nature of the problem to be solved as a whole would have suggested to those of ordinary skill in the art." *In re Kotzab*, 217 F.3d 1365, 1370, 55 USPQ2d 1313, 1317 (Fed. Cir. 2000). Since Neal specifically teaches away from using multiple light sources, there is no motivation to combine Schütze with Neal in order to achieve the claimed features of the present invention.

Accordingly, the present invention is not obvious over either the individual or the combination of the Neal and Schütze references, and the rejection of Claims 1 and 12 under 35 U.S.C. §103 should be withdrawn.

The Examiner has rejected Claims 3 and 14 under 35 U.S.C. §103(a) as being unpatentable over Neal and Schütze in view of Long (U.S. Patent No. 5,986,781).

With respect to Claims 3 and 14, the addition of the Long reference does not make up for the deficiencies in Neal and Schütze.

Accordingly, Claims 3 and 14 are patentable over either the individual or the combination of the Neal, Schütze, and Long references, and the rejection of Claims 3 and 14 under 35 U.S.C. §103 should be withdrawn.

Claims 5 and 16 were rejected under 35 U.S.C. §103(a) as being unpatentable over Neal and Schütze in view of Sasaki et al.

The addition of the Sasaki et al. reference does not make up for the deficiencies in Neal and Schütze.

Accordingly, Claims 5 and 16 are not obvious over either the individual or the combination of the Neal, Schütze, and Sasaki et al. references, and the rejection of Claims 5 and 16 under 35 U.S.C. §103 should be withdrawn.

Claims 10 and 21 were rejected under 35 U.S.C. §103(a) as being unpatentable over Neal and Schütze in view of Sasaki et al.

The Applicants' respectfully submit that one of ordinary skill in the art would not have combined the Neal, Schütze, and Sasaki et al. references, since Schütze is silent with respect to this feature, and Neal clearly teaches away from the use of scanning mirrors (see col. 5, lines 43-46), on which the Examiner relies in Sasaki et al. for use in combination with Neal.

Accordingly, Claims 10 and 21 are not obvious over either the individual or the combination of the Neal, Schütze, and Sasaki et al. references, and the rejection of Claims 10 and 21 under 35 U.S.C. §103 should be withdrawn.

Finally, the Examiner has rejected Claims 11 and 22 under 35 U.S.C. §103(a) as


being unpatentable over Neal and Schütze.

Since Claims 2-11 depend from Claim 1, and Claims 13-22 depend from Claim 12, they are also patentably distinguishable over Neal and Schütze for the reasons cited above with respect to Claims 1 and 12.

If the Examiner believes that there is any issue which could be resolved by a telephone or personal interview, the Examiner is respectfully requested to contact the undersigned attorney at the telephone number listed below.

Applicants hereby petition for any extension of time which may be required to maintain the pendency of this case, and any required fee for such an extension is to be charged to Deposit Account No. 04-1061.

Respectfully submitted,


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Drawing Connections

[illegible]

Diagram illustrating an optical system 10. The system includes a beam splitter 33, a mirror 26, a pentagonal component 20, a lens 24, and a second lens 24. The input beam 28 enters from the top, passes through the beam splitter 33, is reflected by the mirror 26, and enters the pentagonal component 20. The beam then passes through the first lens 24, forming an intermediate image B. It then passes through the second lens 24, forming a final image A on a conjugate plane 12. The distance between the two lenses is labeled 34. Focal lengths f_1 and f_2 are indicated for the lenses. A dashed line 22 represents the optical axis.

Drawing Corrections

REPLACEMENT SHEET

FIG. 3

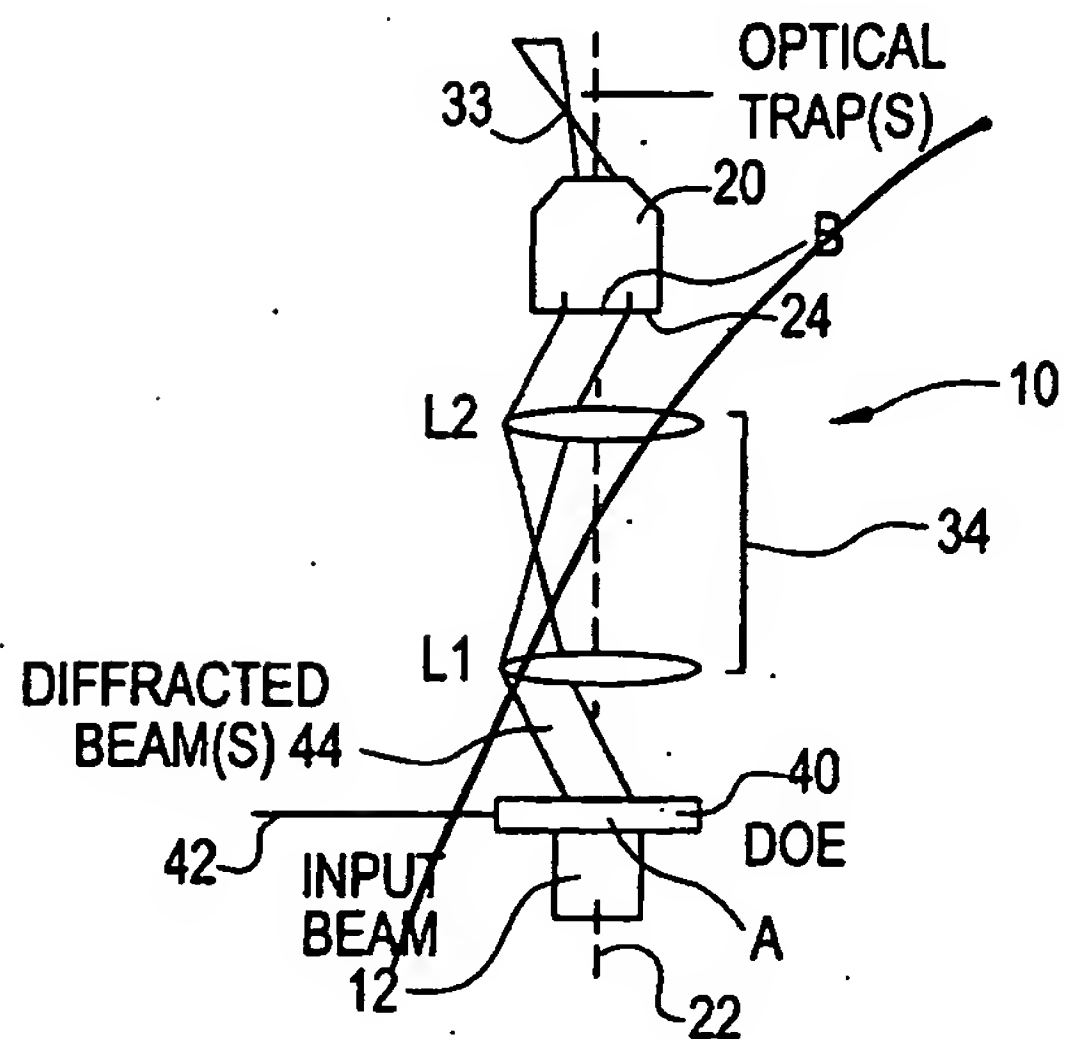


FIG. 4

